THE VETERINARY JOURNAL

A Monthly Review of Veterinary Science

Established 1875.

Editors:

PROFESSOR T. DALLING, M.A., M.R.C.V.S.

PROFESSOR OF ANIMAL PATHOLOGY AND DIRECTOR OF THE INSTITUTE OF ANIMAL PATHOLOGY, CAMBRIDGE UNIVERSITY

and

PROFESSOR J. McCUNN, M.R.C.V.S., M.R.C.S., L.R.C.P.

PROFESSOR OF ANATOMY, THE ROYAL VETERINARY COLLEGE, LONDON.

VOLUME XCVIII

LONDON:
BAILLIERE, TINDALL & COX,
7 & 8, HENRIETTA STREET, COVENT GARDEN, W.C.

1942

XUM

THE VETERINARY JOURNAL

Editor :
PROFESSOR T. DALLING, M.A., M.R.C.V.S.,
Professor of Animal Pathology and Director of The Institute of Animal Pathology, Cambridge University

Sub-Editor :
PROFESSOR J. McCUNN, M.R.C.V.S., M.R.C.S., L.R.C.P.,
Professor of Anatomy, The Royal Veterinary College

JANUARY, 1942

EDITORIAL

1942—THE DUTY OF THE VETERINARY PROFESSION

At the beginning of a new year we extend to our readers the season's greetings. Whatever the year may hold for us we are satisfied that the Veterinary Profession will continue to play its part in the national effort and justify the decision that its members should continue to be classified in the reserved group of occupations. The Veterinary Journal will continue to play its part in bringing before its readers the results of work of interest and importance to the profession carried out in this and other countries.

We have repeatedly urged the necessity of paying great attention to the health of our livestock in these times and to ensure that no lack of effort on the part of the Veterinary Profession will in any way hold back the great national effort to make 1942, and the succeeding years during which the war may last, years of victory. Our effort must be to understand what can be done to preserve the health of our livestock and to carry into practice the methods to control disease and to increase production. It was reported recently that if one extra cow or heifer on every farm calved during the coming autumn the effect on the milk situation would be greatly improved. There are many ways in which this state of affairs could be brought about but one of the important methods is to ensure that all heifers and cows suitable for breeding are used in the effort. Here veterinary surgeons have a great part to play. Infertility in cattle is rife throughout the country. Recent research work has shown some of the causes, preventable means and curative measures. Every veterinary practitioner throughout the country must make himself familiar with all that is known on the subject and must, by personal effort and by taking advantage of the various opportunities open to him, practise the most recent methods of control. Individual cases may require entirely different treatments: concentration on the subject of sterility is now essential.

Important results have also accrued from a study of some of the prevalent infectious diseases which cause either loss directly or indirectly in our livestock.

XUM

The results are found published in scientific journals and are discussed at scientific meetings. Modern proved methods must now take first place in everyday practice. In this time of national emergency we, as a profession, will be failing in our duty if we do not exert every effort to become acquainted with modern proved methods of disease control and health preservation. Every life saved, every day saved in the course of a disease, especially of cattle, sheep and pigs, means more milk, more meat with their consequent repercussions.

Let us then take for our New Year resolve the determination to become acquainted with the latest methods of dealing with diseases of livestock in all their forms and to practise them, having satisfied ourselves as to their efficacy. Agriculturists depend on us. Let us ensure that we as a profession are in the position to provide them with the best advice and practice on preventive and curative treatment for their livestock.

General Articles

SOME NOTES ON THE PRESENT POSITION OF PASTEURELLOSIS IN GREAT BRITAIN

By M. H. KYAW, B.Sc., M.R.C.V.S.,
From the Institute of Animal Pathology, Cambridge

PASTEURELLOSIS has never been a serious disease in Great Britain. Fowl cholera would appear to be the only Pasteurella infection which causes economic loss. From time to time, reports have been made of suspected cases of hæmorrhagic septicæmia in cattle. *P. septica* has been isolated from dogs and cats as shown by Laidlaw and Dunkin and by Dalling in canine distemper and by Dalling in feline distemper. In these diseases the Pasteurella organisms are secondary invaders following virus infection.

Fowl Cholera

Fowl cholera occurs sporadically in Great Britain, though occasionally all the fowls in one pen or even a whole flock may be affected. Most of the reported cases have been epizootics with very high mortality rates. Craig and Ratter (1940) described outbreaks in which the disease was enzootic. Warrack and Dalling (1932) reported sub-acute cases. Fowl cholera was recorded for the first time in Scotland by Wilson and Wilson (1935).

All species of birds, including wild birds, are naturally susceptible (Rice, 1926, Dobson, 1934). Rice (1926) described an outbreak of fowl cholera in geese (Goose cholera) in which 2,100 birds died out of 2,500. Mayall (1934) also described a case of "Goose cholera." Craig and Ratter (1940) described outbreaks in which geese were involved. Geese seem to be more susceptible than fowls (Craig and Ratter, 1940) and chicks less than the adult birds (Rice, 1926). There is no evidence that fowl cholera affects animals other than birds. An extensive outbreak occurred in East Anglia in 1933. The disease spread rapidly following its introduction and caused the death of a large number of birds, including fowls, ducks, turkeys and geese. It is highly probable that the outbreak in Scotland described by Wilson and Wilson (1935) originated in fowls infected during the epizootic in East Anglia.

The disease is usually very acute. Birds are found dead without having shown any premonitory symptoms. When symptoms are observed, they comprise acute enteritis with a green diarrhœa and the usual symptoms associated with a septicæmia with a rapid course. The rate of mortality rapidly reaches a peak and then subsides and towards the end of the outbreak there occur chronic cases, in which are seen symptoms of nasal and respiratory catarrh and œdema of the wattles. In some cases chronic nasal carriers are produced (Craig and Ratter, 1940). Chronically infected birds may appear unthrifty and some may show lameness (Rice, 1926).

Post-mortem lesions are usually acute hæmorrhagic enteritis, hæmorrhages on the peritoneum and heart and pneumonia: the most constant lesions, however, are necrotic foci in the liver.

XUM

Diagnosis is usually made by demonstrating bipolar-staining organisms in smears of tissues and blood. Dobson (1934) directed attention to the fact that reliance could not be placed upon such a method of diagnosis, and suggested that bipolar-staining organisms should be demonstrated in bone marrow, that tissue apparently being one of the last sites invaded by secondary organisms. He also suggested that the Pasteurella should be isolated and shown to be lethal to fowls within 36 hours and recovered again in pure culture from the dead experimental bird.

There appears to be no successful curative treatment for fowl cholera. Control measures, such as the destruction of all affected birds and isolation of in-contacts, the thorough disinfection of the houses, runs and ground and the isolation from three to four weeks of newly-purchased birds and those that have returned from markets seem to produce satisfactory results. Gordon (1924) reported success in checking further losses in an outbreak by the use of an autogenous vaccine. In his experiments, however, no controls were kept.

The epizootiology of the disease has been studied by Craig and Ratter (1940) and to some extent by Warrack and Dalling (1932). The former authors were of the opinion that the disease was introduced into flocks of poultry by newly-purchased birds which were nasal carriers or by intermediate means. They also described outbreaks in which there was evidence that the disease was enzootic. They thought that some of the birds which survived a previous outbreak became nasal carriers, the organisms assuming pathogenic characters when conditions became favourable and thus spreading the disease. In one outbreak they obtained evidence of the existence of infected ground in addition to the presence of carriers. Finally, they noted that the disease seemed to be at its height in September, October and November.

Warrack and Dalling (1932) met only sub-acute cases. Judging from the slowness of the spread of the disease and the comparatively low mortality rate amongst the affected poultry, they were of the opinion that fowl cholera existed in this country mostly as a sub-acute disease. They also recorded for the first time the existence of the so-called "Wattle disease," in which there is an œdema of the wattles and from the contents of which they recovered pure cultures of *P. aviseptica*. The mortality rate amongst birds affected with "Wattle disease" is extremely low. Although affected birds suffer no apparent ill-health, these authors recorded a case in which a healthy bird having sustained injuries about the head and wattles in a fight with an affected cockerel became very ill within 48 hours and died the next day. Post-mortem examination revealed a picture typical of fowl cholera and the causal organism was recovered from its carcase. Thus, birds suffering from "Wattle disease" must be regarded as potential sources of avian pasteurellosis.

Although fowl cholera is not very common, Warrack and Dalling were of the opinion that many cases, especially of the sub-acute and chronic disease, were not detected, the true disease often being masked by other affections, such as tuberculosis, fowl pox, etc.

Dobson (1934) seemed to agree with Warrack and Dalling when he stated that where introduction of the disease was not traceable to imported poultry outbreaks of fowl cholera were mild and did not cause the loss of any appreciable

number of birds. There is evidence, however, that at times serious epizootics have occurred, even in flocks which have had no contact with imported poultry, such as that described by Gordon (1924) and one of the outbreaks described by Craig and Ratter (1940). The mortality rates were very high, sometimes 100 per cent., and in some cases destruction of the whole flock or of all the fowls in affected pens or runs was necessary in order to check further spread. Wilson and Wilson (1935) suggested the introduction of legislative measures to control indescriminate sale of birds, and Dobson (1934) urged taking similar measures to enforce the prohibition or quarantime of imported poultry. The Poultry and Hatching Eggs (Importation) Order of 1936 meets Dobson's point.

Pasteurellosis of bovines

The existence of true hæmorrhagic septicæmia in this country is doubtful, but occasionally veterinarians have recorded cases of sudden death or acute fatal illnesses in cattle which, on further investigation and post-mortem examination, were suggestive of that disease.

Pasteurella-like bipolar-staining, gram-negative, ovoid, non-motile bacilli have often been isolated from cases of pneumonia in cows and calves, both on farms and at abattoirs. Tweed (1930) described many such cases which he encountered at the abattoir. Edington (1930) isolated organisms from specimens sent to him by Tweed. A study of the biological characters of these bacteria, together with the post-mortem picture and clinical features, led these observers to believe that they were dealing with the pectoral form of hæmorrhagic septicæmia.

Gaiger (1931), after criticising the findings of Tweed and Edington, denied the existence of hæmorrhagic septicæmia, but Shirlaw (1938) agreed with their view.

Several observers from other parts of Great Britain have also reported cases of what they believed to be hæmorrhagic septicæmia in cattle. Turner and Holmes (1938) described a condition which they termed " Epizootic Bovine Pasteurellosis " in three herds of cattle in East Anglia; Pickering (1939) described outbreaks in Northumberland; Downham and Yarrow (1939) in Shropshire; Foggie and Lamont (1939) in Northern Ireland; Hall (1939) in Somerset; and Buchanan (1939) in Scotland.

Lovell (1939) recorded for the first time in this country the isolation of *P. septica* from the udder secretion of a cow suffering from mastitis.

In an attempt to form an opinion as to whether true hæmorrhagic septicæmia does exist in this country the following comparison is made of the similarities and differences of the disease reported in Great Britain and true hæmorrhagic septicæmia in countries such as India, Burma, Egypt, etc., where it is prevalent.

For convenience the salient features of the outbreak described by Tweed and Edington are selected for comparison with those of the classical hæmorrhagic septicæmia of the tropical countries.

A.—Clinical aspects

Similarities

Pneumonic symptoms predominate in both diseases. There is difficulty in breathing, accompanied by a cough. Auscultation of the chest reveals areas of consolidation in the lungs with fluid in the chest cavity. Pleurisy is present in both diseases.

Differences

Tweed and Edington's cases showed no intestinal symptoms, whereas in the typical pectoral form of true hæmorrhagic septicæmia there is profuse and bloody diarrhœa following an initial period of constipation.

B.—Pathological aspects

Similarities

Pneumonia with consolidation of the lungs is present in both diseases. The interlobular septa are distended, giving rise to a marbled appearance, similar to that seen in bovine pleuro-pneumonia. Petechial hæmorrhages are present on the heart, under the epicardium and on the endocardium.

Differences

Tweed and Edington's cases	*Typical pectoral form of hæmorrhagic septicæmia*
Cows. No intestinal lesions, except in one, in which there was inflammation of the fourth stomach and of the intestines.	Intense hæmorrhagic enteritis is a constant feature. Ulceration is absent.
Calves. Inflammation of the duodenum, intestines and fourth stomach was present in all four calves examined.	
Ulceration in the duodenum was present in three of the four cases.	
No endocarditis.	Hæmorrhagic endocarditis is present, especially around columnæ carnæ.

C.—Ætiological aspects

Similarities

Bipolar-straining organisms isolated from both diseases.

Differences

Tweed and Edington's cases	*Typical pectoral form of hæmorrhagic septicæmia*
Bipolar organisms were not found in blood by microscopic examination. Blood cultures were negative except in the case of two calves. Biological characters of organisms isolated varied considerably from the characters of typical *P. septica.*	Bipolar-staining organisms are seen in the blood during life and after death.
	Blood cultures are always positive.
	The causal organisms are typical *P. septica.*

In both diseases, bipolar-staining organisms are found, but the differences between these organisms are numerous. Thus, those isolated by Edington did not produce indole, were lactose fermenters and produced acid in litmus milk, and three of the cow strains and both calf strains produced hæmolysin. Serologically, they had no relationship with *P. boviseptica* isolated from typical cases of hæmorrhagic septicæmia in America or typical *P. septica*

isolated from other animals. Instead, they fell into Jones' Group 1, the biological characters of which give rise to doubt as to their identity with true Pasteurellas. The organisms isolated by Edington were also non-pathogenic for rabbits and except in one case, where a dose of 50×10^9 organisms injected intravenously was lethal; no fatal infection occurred in calves.

Shirlaw's (1938) description of the symptoms in cases seen by him in Northumberland bore a closer resemblance to those of true hæmorrhagic septicæmia. He demonstrated bipolar-staining organisms in smears from blood, lungs, spleen, liver and mediastinal, cervical and systemic lymph glands immediately after the destruction of a yearling in the acute phase of the disease. The infecting organisms were cultivated easily from all tissues, including peripheral blood and the sero-fibrinous exudate in the chest cavity. The organisms were found to be similar to those described by Edington.

Discussion

Although clinically and pathologically there are a number of striking similarities between the diseases described by the above-mentioned authors, especially concerning the cases described by Shirlaw and the classical pectoral form of hæmorrhagic septicæmia, there seems little doubt that the causal organisms are entirely different. Thus, true *P. boviseptica* is a non-lactose fermenter, produces indole, does not produce hæmolysin and is highly pathogenic for laboratory animals and cattle; these characters do not apply to the organisms described by Edington and by Shirlaw. Further, those organisms cannot be regarded as non-virulent strains or simply as variants of typical *P. boviseptica*, because Edington showed that no serological relationship existed between the organisms he studied and true *P. septica*. On the other hand, the virulent and non-virulent variants of *P. lepiseptica* (De Kruif, 1929), and other *P. septica* (personal observation) are antigenically identical. In addition, the biological properties of the two organisms are so widely different that the difference cannot simply be due to variation. Edington's strains were non-pathogenic even in large doses injected into rabbits intravenously, intraperitoneally or subcutaneously, whereas *P. boviseptica* is lethal in very small doses. Edington's finding that ten million organisms injected intravenously killed rabbits, and fifty thousand millions intravenously killed a calf, may be explained by the fact that the doses were huge and the animals died simply from the presence of an excessive number of organisms in the blood stream.

The question therefore arises as to whether we can accept the view of Tweed and Edington and others that they were dealing with the pectoral form of hæmorrhagic septicæmia. It would seem that all the cases recorded cannot be accepted as true hæmorrhagic septicæmia, for this term denotes a specific disease caused by a specific micro-organism. To consider the condition described by most of these authors as hæmorrhagic septicæmia simply because bipolar-staining organisms were isolated is very misleading. There has been the tendency to classify any bipolar-staining organism as a *Pasteurella*, but *Pasteurellæ* as defined in classical bacteriology are not the only bipolar-staining organisms nor is the character of bipolarity the sole criterion of *Pasteurellæ*. Thus, ageing cultures of *B. coli* and certain *Actinobacilli* show bipolar staining and many *Salmonellas* show peripheral

XUM

straining, which may easily be mistaken for bipolar staining. Many pasteurella-like, bipolar-staining organisms have been isolated and described by various authors, e.g., Jones and Little (1924), Bull *et al.* (1927) and Garcia (1927). Jones and Little and Garcia isolated the organisms from cattle. Whereas Jones' organisms did not produce gas in "sugars," Garcia's organisms produced gas in many "sugars." Garcia claimed that he isolated the organisms from undoubted cases of hæmorrhagic septicæmia but he did not give any information of the post-mortem findings or the clinical history of the animals from the glands of which he obtained his cultures. Bull *et al.* (1927) isolated an organism in association with *P. lepiseptica* from cases of snuffles, subcutaneous abscesses and purulent conjunctivitis in rabbits. Although he did not mention bipolar-staining, he noted that the organism produced hæmolysin and fermented lactose, did not produce indole and had no antigenic relationship with *P. lepiseptica.* It is highly probable that if he had made smears directly from the fluids and tissues of the rabbit he would have shown bipolar-staining. Even from the biological properties described, his organisms appear to be very similar to those described by Edington and those belonging to Group 1 of Jones as described by Jones (1921).

Considering the bacteriology of the organisms isolated by Edington, Shirlaw and many others, there appears to be a close similarity between them and those isolated and described by Montgomerie *et al.* (1938) from cases of enzootic pneumonia in sheep in this country. These authors drew attention to the differentiation of their organisms from *P. septica,* especially in respect to pathogenicity to laboratory animals.

To avoid further confusion, therefore, the writer suggests that such organisms should be termed "*Pseudo-pasteurella pneumoniæ*" (*sp. nov.*) bearing in mind that they are associated mainly with pneumonia and that they bear some resemblance to the Pasteurella group, but are not true members of it.

From the observation of others, however, the relationship of the diseases with which they worked indicates a closer relationship with hæmorrhagic septicæmia. Downham and Yarrow (1939) described acute cases of what they believed to be true hæmorrhagic septicæmia. Microscopical examination of blood, spleen, lymph glands and mesenteric glands of two cows showed numerous bipolar-staining organisms. The authors tested the pathogenicity of these organisms on laboratory animals by injecting guinea pigs and rabbits with saline emulsions of gland tissue and gland exudate, some subcutaneously and others intraperitoneally. They found that even 0.25 c.c. of popliteal gland exudate injected subcutaneously into a rabbit caused its death in 12 hours. They claimed to have recovered pure cultures of *Pasteurella* organisms from heart blood, spleen and liver of all inoculated animals and from blood, bone marrow, spleen and popliteal and mesenteric glands of affected cattle; they did not, however, record the results of complete bacteriological examinations.

Foggie and Lamont (1939) also described the isolation of *Pasteurellæ* from two calves which died suddenly. They injected subcutaneously into a rabbit a saline emulsion of a small piece of cerebral hemisphere. This tissue was selected as being less likely to contain putrefactive organisms. The rabbit died within 36 hours and bipolar-staining organisms were seen in blood smears and were recovered in pure culture. The organisms were later identified as *P. septica.* The

post-mortem findings were interesting in that there was an absence of marbling of the lungs. Downham and Yarrow found acute congestion of the lungs in one animal, while in the other there was also a gelatinous exudate in the inter-lobular septa. Foggie and Lamont noted that the lungs of the calves were solid in the dependent areas and extensive areas of blood-stained œdema were present in the dependent parts of the body and in the submaxillary regions and masseter muscles. Hæmorrhages were also seen in the muscles, on the pleura and on the endocardium. There was also acute hæmorrhagic enteritis.

The cases mentioned would appear to resemble closely true hæmorrhagic septicæmia. Lack of the marbling of the lungs may be explained by the fact that the cases were peracute, the animals dying within 24 hours. Swelling of the head as noted by Foggie and Lamont and œdema of the submaxillary and throat regions as noted by Downham and Yarrow point to the œdematous form of hæmorrhagic septicæmia, in which marbling of the lung is not usually found.

The writer has examined a strain of *Pasteurella* isolated from the lungs of a calf on January 2, 1939, by Mr. C. V. Watkins, M.R.C.V.S., D.V.S.M., Seale Hayne Agricultural College, Newton Abbot, Devon. The history and case records are not fully recorded but it is known that the farmer had been losing calves from an acute disease. Symptoms developed rapidly overnight and death took place in a short time. Post-mortem examination showed pleurisy and the marbled appearance of the lungs. A blood smear stained by Leishman's stain suggested *Pasteurella* infection. This culture came into the possession of the writer through the courtesy of Professor Bosworth and Mr. A. W. Gledhill.

This strain, labelled *P1,* is a typical bipolar-staining organism, whose cultural, morphological and biochemical characters cannot be distinguished from *P. aviseptica* or *P. suiseptica.* It ferments xylose, galactose, glucose, lævulose, maltose, sucrose, mannitol and sorbitol without producing gas, while neither acid nor gas are produced in arabinose, rhamnose, lactose, trehalose, raffinose, dextrin, inulin, starch, glycerol, dulcitol, salicin, or inositol. It is neutral in litmus milk, produces indole, is negative for M.R. and V.P., does not produce H_2S, does not liquefy gelatin nor reduce methylene blue, but reduces nitrates. No visible growth occurs on potato.

Its virulence was compared on mice and developing chick embryos with a strain of *P. aviseptica* isolated from a fowl by Mr. Blakemore in the 1933 epizootic of fowl cholera in East Anglia and a strain of *P. suiseptica* isolated from the lungs of pigs by Blakemore and Gledhill in 1940.

Techniques. In both experiments, 18-hour cultures on plain agar slopes were washed off with plain broth and standardised to opacity Brown 1 tube; progressive dilutions were then made in plain broth. Mice received 0.5 c.c. each, intraperitoneally.

In the experiment on developing chick embryos, a modification of Burnet's method was used. Fourteen days old embryos were used. A small triangular piece of shell is removed from over the site of the embryo. The air sac is drilled and some air sucked off by a teat. Using the sharp point of a needle the exposed shell membrane is then very carefully scratched until it just breaks. Sufficient air is now sucked off to make the embryonic membranes fall slightly in the region of the triangle. The shell membrane is then torn off, leaving small pieces at the angles

of the triangle. 0.05 c.c. of the inoculum is dropped on to the exposed chorio-allantoic membrane, using a micro-pipette. The cut piece of shell is then replaced, resting on the piece of shell membrane left at the angles and sealed off with a mixture of vaseline and beeswax.

TABLE I

Titration of the comparative virulence of P1, P. aviseptica and P. supiseptica on mice

(Since the preliminary titration showed that all three strains killed mice in dilutions of 10^{-6} of Brown 1 higher dilutions were used)

Dilution of inoculum	*Mice*	*P. aviseptica*	*Mice*	*P1*	*Mice*	*P. suiseptica*
10^{-5}	1	Died 22 hours	10	Died 30 hours	19	Died 44 hours
	2	Died 30 hours	11	Died 30 hours	20	Alive after 3 weeks
	3	Died 36 hours	12	Died 30 hours	21	Alive after 3 weeks
10^{-7}	4	Died 36 hours	13	Died 36 hours	22	Died 22 hours
	5	Died 23 hours	14	Died 36 hours	23	Died 3rd day
	6	Died 16 hours	15	Died 30 hours	24	Died 6th day
10^{-6}	7	Died 12 hours	16	Died 30 hours	25	Died 44 hours
	8	Died 12 hours	17	Died 25 hours	26	Died 5th day
	9	Accidentally killed	18	Died 25 hours	27	Died 6th day
		3 Controls: Survived				

Post-mortem appearances. In all cases the external inguinal and axillary lymph glands were hæmorrhagic and enlarged, the liver was fatty and pneumonia was present in most of the mice. Pleural exudate was present in those that received *P. aviseptica.* Bipolar-staining organisms were seen in smears of the heart blood of all and were isolated in pure culture.

Post-mortem appearances. Thickened œdematous chorio-allantois, congested or hæmorrhagic embryo, fatty liver, opaque heart and hæmorrhages in the place of inoculation in all embryos. Pure cultures were recovered from the heart blood and allantoic fluid.

Note. The end point was not reached in the case of *P. suiseptica,* as after 48 hours, while those embryos which had received 10^{-6} were still alive, the incubator went cold and thus interfered with the experiment.

The results shown in Table I and II demonstrate the very high virulence of *P1.* From all the above observations, it can be concluded that *P1* is probably a typical *Pasteurella* and highly virulent for laboratory animals. Professor Bosworth (personal communication) also reported that another strain isolated from the heart blood of a calf sent to him by Mr. Watkins from a second outbreak on February 7, 1939, was a typical *Pasteurella* and highly virulent for rabbits. The history was again of a peracute disease in calves, which became suddenly ill and died in a few hours. Before the acute symptoms developed, the animals had been coughing for some days.

There appears, therefore, to be some evidence that there exists in this

TABLE II

Titration of comparative virulence of P1, P. aviseptica, and P. suiseptica on developing chick embryos

(Since preliminary titration showed that all the strains killed chick embryos in high dilutions, the experiment was started off with dilutions higher than that indicated for each strain)

No.	*Dilution of inoculum*	*P. aviseptica*	*No.*	*Dilution of inoculum*	*P1*	*No.*	*Dilution of inoculum*	*P. suiseptica*
1	10^{-9}	Living 5th day	16	10^{-8}	Living 6th day	31	10^{-6}	?
2		„ „ „	17		Died 36 hrs.	32		?
3		„ „ „	18		„ „ „	33		?
4	10^{-8}	Died 48 hrs.	19	10^{-7}	Living 6th day	34	10^{-5}	Died 36 hrs.
5		Living 6th day	20		„ „ „	35		„ „ „
6		„ „ „	21		Died 24 hrs.	36		Died 24 hrs.
7	10^{-7}	Died 48 hrs.	22	10^{-6}	Died 36 hrs.	37	10^{-4}	„ „ „
8		„ „ „	23		Died 18 hrs.	38		„ „ „
9		Living 6th day	24		Living 6th day	39		Died 36 hrs.
10	10^{-6}	Died 48 hrs.	25	10^{-5}	Died 18 hrs.	40	10^{-3}	„ „ „
11		„ „ „	26		„ „ „	41		„ „ „
12		Died 53 hrs.	27		„ „ „	42		Died 24 hrs.
13	10^{-5}	Died 24 hrs.	28	10^{-4}	„ „ „			
14		„ „ „	29		„ „ „			
15		„ „ „	30		„ „ „			

3 Controls: Survived.

country a disease with much resemblance to pectoral form of hæmorrhagic septicæmia.

Relationship between Hæmorrhagic Septicæmia and Transit Fever

It is the popular opinion that transit fever is associated with *P. boviseptica*. Bipolar-staining organisms, which are at once labelled *P. boviseptica*, have been isolated in pure culture from the lungs of animals dead of transit fever. Anderson (1939) was of the opinion that no specific organism has been isolated and Pickering (1939) definitely stated that the ætiology of the condition was unknown. He thought that the causative agent might be a virus which predisposes to secondary bacterial infections.

The writer could not find any literature regarding work on the ætiology of this disease. He is reluctant to call the organism associated with this disease *P. boviseptica* while its true identity is not worked out fully. However, the constancy with which pure cultures of a Pasteurella-like organism was isolated from these cases is very significant, whether the predisposing causes are the accepted sudden

changes in temperature, bad hygiene in transit or fatigue, either associated or not with a virus.

Although many people think that transit fever and the pectoral form of hæmorrhagic septicæmia are the same disease condition, there are striking differences. The onset of transit fever is gradual, whereas that of hæmorrhagic septicæmia is sudden and rapid; transit fever is a catarrhal affection, whereas the other is a septicæmia; the post-mortem picture of transit fever shows no petechiæ and no exudation in the chest, whereas there is much blood-stained exudate in the chest in hæmorrhagic septicæmia. Diarrhœa is not always present in transit fever and, if present, is not usually blood stained as in hæmorrhagic septicæmia, but of normal colour although the fæces may contain blood clots. Pneumonia in transit fever is lobular in type, whereas that in hæmorrhagic septicæmia is an interstitial type.

Hepburn (1925), Anderson (1939) and Pickering (1939) have written descriptions of transit fever. Anderson divided transit fever into three clinical types: (1) *Pectoral type,* where symptoms were confined to the region of the chest with pneumonic symptoms predominating. (2) *Intestinal type,* where there was profuse diarrhœa, following constipation. (3) *Pleuro-pneumonic or three days type,* where the animal developed acute symptoms and died quickly. This he claimed was often considered to be hæmorrhagic septicæmia.

Surveying the whole field of these diseases associated with *Pasteurellas* in bovines, it is obvious that a good deal of bacteriological research remains to be done. For instance, it would be very interesting and useful to find out what relationships exist between true *P. boviseptica* and the organisms belonging to Jones' Group 1 and between the latter and the organisms described by Montgomerie *et al.* as causing enzootic pneumonia in sheep. The successful use of vaccines prepared from typical *P. septica* in immunising the cattle against the spread of reported cases believed to be hæmorrhagic septicæmia (Turner and Holmes, 1938) indicates that there may exist a certain relationship between true *P. septica* and Jones' Group 1 organisms. It is hoped to follow up this work in due course.

Swine Plague

The author could not find any literature on this disease as such in this country. Claxton (1940) claimed that he had never seen a case of pure swine plague, the cases suggestive of that disease having been proved ultimately to be swine fever. But, Hare, in opening the discussion on Claxton's paper, stressed the difficulty of diagnosing swine plague in the field and pointed out that laboratory work was necessary. He claimed to have come across 5-10 per cent. of this disease in his experience of post-mortem examinations on pigs.

Summary

A description is given of the diseases of domestic animals in Great Britain associated with the presence of organisms of the *Pasteurella* group. The only example of true pasteurellosis is fowl cholera. In bovines there occur diseases resembling hæmorrhagic septicæmia in several aspects, including the type of

organism isolated from infected tissues. The differences and similarities between such infections and true hæmorrhagic septicæmia as found in tropical countries are discussed. There is still some doubt as to whether true hæmorrhagic septicæmia in cattle occurs in this country.

Acknowledgments

The writer wishes to acknowledge his thanks to Professor Dalling for the interest shown and the encouragement given in the work on organisms of the genus *Pasteurella,* which the writer is still doing, and for his permission to work in the Institute of Animal Pathology. Thanks are due also to Mr. C. A. McGaughey for injecting the mice and for criticism and interest shown in the work, and to Professor Bosworth for furnishing information concerning the strain *P1.*

REFERENCES

Anderson, J. (1939): "Transit fever, a clinical survey." *Vet. Rec., 51,* 65.
Buchanan, J. M. (1939): "Hæmorrhagic septicæma in the bovine: a case for diagnosis." *Vet. Rec., 51,* 1127.
Bull, Carroll, G., and McKee, C. M.: (1927): "Description of an unidentified bacillus occurring in cultures from the nasal discharges and purulent infections in rabbits." *Am. J.Hyg., 7,* 114.
Claxton, B. A. (1940): "The differential diagnosis of acute febrile diseases in pigs." *Vet. Rec., 52,* 217.
Craig, J. F., and Ratter, A. (1940): "The epizootiology of fowl cholera." *Vet. J., 96,* 296.
De Kruif, P. H. (1929): "Dissociation of microbic species." *J. Exp. Med., 33,* 773.
Dobson, N. (1934): "Some poultry diseases." *Vet. Rec., 14,* 332.
Dobson, N. (1934): "The control of poultry diseases." *Vet. Rec., 14,* 1354.
Downham, K. D., and Yarrow, T. B. (1939): "Hæmorrhagic septicæmia in cattle." *Vet. Rec., 51,* 279.
Foggie, A., and Lamont, H. G. (1939): "Two cases of suspected hæmorrhagic septicæmia in bovines in Northern Ireland." *Vet. Rec., 51,* 979.
Gaiger, S. H. (1931): "Bovine pneumonia: is it identical with hæmorrhagic septicæmia?" *Vet. Rec., 11,* 171.
Garcia, O. (1927): "A pleomorphic and gas-forming bipolar bacillus isolated from the lymph glands of slaughtered cattle." *Philippine J. of Sci., 33,* 331.
Gordon, A. K. (1924): "An outbreak of chicken cholera." *Vet. J., 80,* 73.
Hall, E. B. D. (1937): "Some clinical phases of a disease strongly resembling septicæmia hæmorrhagia occurring in this country." *Vet. Rec., 49,* 1382.
Hepburn, W. (1935): "A clinical survey of transit fever in bovines." *Vet. Rec., 5,* 201.
Jones, F. S. (1921): "A study of *B. bovisepticus.*" *J. Exp. Med., 34,* 561.
Jones, F. S., and Little, Ralph B. (1921): "An outbreak of pneumonia in dairy cows attributed to *Bacillus bovisepticus.*" *J. Exp. Med., 35,* 541.
Lovell, R. (1939): "The Isolation of *Pasteurella septica* from the Udder Secretion of a Cow." *Vet. Rec., 51,* 747.
Mayall, G. (1934): "Goose cholera." *Vet. J., 90,* 389.
Montgomerie, R. F., Bosworth, T. J., and Glover, R. E. (1938): "Epizootic pneumonia in sheep." *J. Comp. Path., 6,* 87.
Pickering, J. F. (1939): "Differences in clinical pictures of transit fever and hæmorrhagic septicæmia." *Vet. Rec., 51,* 277.
Rice, J. P. (1926): "The more important bacterial and protozoal diseases of poultry." *Report of annual congress of N.V.M.A.,* 1926, p. 103.
Shirlaw, J. F. (1938): "On the existence of hæmorrhagic septicæmia in the British Isles." *Vet. Rec., 50,* 1005.
Turner, F. R., and Holmes, C. R.: "Epizootic bovine Pasteurellosis in Great Britain." *Vet. Rec., 50,* 1010.
Tweed, W., and Edington, J. W. (1930): "Pneumonia in bovines due to Pasteurella bovi-septica." *J. Comp. Path., 43,* 234.
Warrack, G. H., and Dalling, T. (1932): "Fowl cholera in England." *Vet. J., 88,* 26.
Wilson, J. E., and Wilson, D. R. (1935): "An outbreak of fowl cholera in Scotland." *Vet. J., 91,* 57.

XUM

Clinical Articles

AN INTERESTING CASE OF PNEUMONIA IN A DAIRY COW

By J. PICKUP, M.R.C.V.S.,
Barnet, Hertfordshire

THE case, which is described in this communication occurred in August, 1939, and would have been put on record at the time but for the reasons given below. It is now published at the request of Mr. M. H. Kyaw, whose review of pasteurellosis in Great Britain appears elsewhere in this issue (Kyaw, 1942).

Clinical History

The subject was a non-pedigree Dairy Shorthorn heifer, in lactation following her first calving. She was one of about 80 milking cows—the total herd numbered about 150 animals—maintained on the 1,000-acre mixed farm attached to an institute in this country. The herd was comprised almost entirely of Dairy Shorthorns, and was not self-contained. The incidence of contagious abortion was low, but there was a fairly high percentage incidence of reactors to the tuberculin test. Poultry and pigs were maintained on the farm, but in normal circumstances the former had little, and the latter no opportunity of coming into close contact with the dairy herd.

The heifer was reported ill on August 10, and was seen by myself on the following day. Her temperature was then 105.0 deg. Fahr., and her respirations were 40/minute. Breathing was not laboured and there were no abnormal chest sounds. Her muzzle was red and the papillæ and the mucous membranes of the cheek and tongue had an inflamed appearance. Her eyes were inflamed and discharging and there was a snotty discharge from the nose. The attendant stated that her nose had bled on the previous day. Her brisket was tender and a little swollen, and there was a peculiar scurfy eruption over the brisket, and crutch. The animal gave the impression of being in pain, standing uneasily with her head held low. The attendant was certain that her head, which was generally tender, had appeared swollen on the previous day. There was, of course, a fall in milk secretion.

The animal was seen on six further occasions. The scurfy condition spread to the poll and then over almost the entire body, and on one day there was froth at the mouth. A belladonna electuary was prescribed. Within a few days the soreness of the muzzle and tongue had subsided, and the nasal discharge had cleared up. She seemed slightly easier, but her temperature remained elevated and varied between 103.4 and 106.0 deg. Fahr.

Towards the end of the first week, however, the respiratory rate increased to 64/minute and the pulse, which had been fast throughout, rose to 94. On August 24 her nose again became snotty and her muzzle reddened, while some

abnormality of the chest sounds was detected. She died in the evening five days later, after exhibiting blowing respirations and a profuse watery diarrhœa. The rumen became rapidly tympanitic on death. Throughout the whole illness her appetite had been poor, rumination had been in abeyance, and defæcation had been irregular.

Post-mortem and Laboratory Findings

Owing to the slaughtering arrangements it was not possible to conduct a full post-mortem examination, but at my request the lungs were preserved and were examined within 24 hours of death. The knackerman reported that the remainder of the carcase was "clean" apart from evidence of pleurisy. Some degree of pleurisy was evident also from the condition of parts of the lung-surface.

Large areas of each lobe were dark red in colour, and had presumably undergone fairly extensive post-mortem changes. These areas were sharply defined from the smaller remaining areas, including those parts adjacent to the diaphragm, which were normal or merely congested in appearance. There was a vile stench from the affected parts. Suitable material was taken with due precautions, and was forwarded to a laboratory for examination. The more important laboratory findings may be summarised as follows: Sections of the lungs showed marked histological changes in the affected areas, which were sharply defined from the normal tissue. The changes were essentially those of a bronchopneumonia which had extended until the condition was almost lobar in distribution. Necrotic and gangrenous changes were present in the affected areas, but there was a conspicuous absence of polymorphs. A fibrinous exudate was present in the alveoli. Smear preparations contained bipolar-staining organisms. Cultures from the swabs taken at the post-mortem examination of the lungs were grown upon agar and serum-agar, and revealed colonies of the Gram-negative, bipolar-staining organism which were successfully sub-cultured. A few colonies of *Staphylococcus citreus* appeared on primary culture, and were presumably contaminants. I was given to understand that the morphological and cultural characteristics of the organism were typical of those described for Pasteurella.

Discussion

I was very grateful indeed for the laboratory examination, but was advised that the very interesting findings did not suffice to answer the question of whether or not the condition was one of "pasteurellosis." Only that summer, the paper of Lovell (1939) and its discussion at the N.V.M.A. Congress had shown that far too many cases had been described as "pasteurellosis" on quite inadequate bacteriological grounds.

The case was nevertheless of great clinical interest, and some of the symptoms, e.g., scurfy condition, painful swellings, are described by Hutyra and Marek (1913) as occurring in certain cases of hæmorrhagic septicæmia.

Summary

An interesting fatal case of bovine pneumonia is described. A Gram-

XUM

negative, bipolar staining organism, which apparently had morphological and cultural properties similar to those of *Pasteurella* was recovered from the lungs.

REFERENCES

Hutyra, F., and Marek, J. (1913): *Special Pathology and Therapeutics of the Diseases of Domestic Animals.* [1st English edition, by J. R. Mohler and A. Eichhorn.] London: Baillière, Tindall & Cox.

Kyaw, M. H. (1942): "The present position of Pasteurellosis in Great Britain." *Vet. Jnl., 98.* [This issue.]

Lovell, R. (1939): "Causes of death among calves in dairy herds." *Vet. Rec., 51,* 1081-1086. Discussion, pp. 1086-1094.

CHRONIC FOCAL INTERSTITIAL HEPATITIS IN THE PIG: PRELIMINARY REPORT ON THE EFFECT OF FEEDING EMBRYONATED ASCARIS EGGS

By J. N. OLDHAM and E. G. WHITE

Research Institute in Animal Pathology, Royal Veterinary College, London

In a previous paper (White, 1941) one of us described a condition commonly found in pig livers and termed "white spot liver" or "milk spot." The lesions consist of focal areas of hæmorrhage and degeneration, inflammation and fibrosis, associated with a very intense infiltration of eosinophil leucocytes. Evidence was presented which suggested that the condition was probably caused by the migration through the liver of *Ascaris* larvæ on their way to the lungs. We have recently attempted to reproduce the condition by feeding embryonated *Ascaris* eggs to young pigs and this short note gives a summary of our findings in the first litter of pigs which was used.

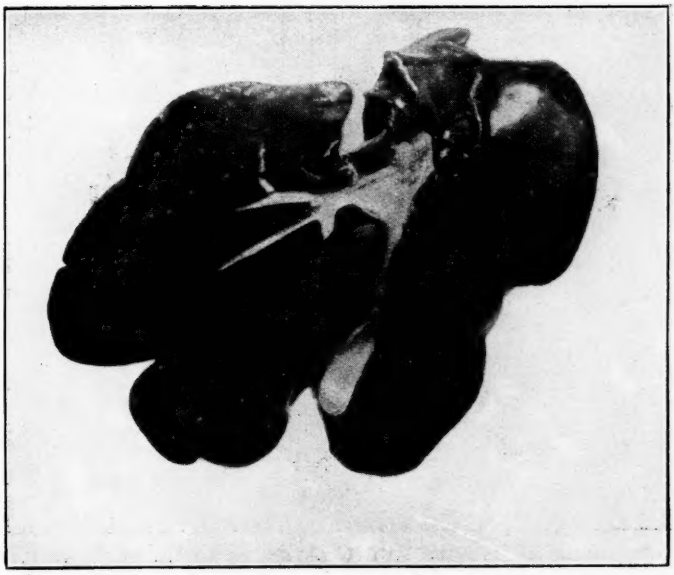
The *Ascaris* eggs had been allowed to develop to the infective stage during the 12 weeks preceding the experiment. Three pigs were kept as controls and the remaining five animals were given a single dose of eggs which varied from 200,000 to about 400,000. The pigs were killed at intervals which varied from 48 hours to 27 days after receiving the infective dose. All the pigs were eight to 11 weeks old at the time of feeding and the three control animals were killed at the beginning, middle and end of the experiment respectively.

All animals given *Ascaris* eggs showed numerous liver lesions in varying stages of development which resembled those described in the previous paper as characteristic of "white spot liver." Early lesions consisted of foci of hæmorrhage and liver cell destruction, followed rapidly by an intense eosinophil infiltration and proliferation of fibroblasts. Older lesions frequently showed new formation of lymphoid tissue as was described in the naturally occurring condition.

Blood films were made at the time of killing and the eosinophils in 1,000 leucocytes were counted. In the three control pigs the eosinophil counts were 1.6 per cent., 2.2 per cent. and 2.4 per cent. respectively. In the pigs fed *Ascaris* eggs the eosinophil counts varied from 3.4 per cent. in an animal killed six days after feeding to 15.7 per cent. in one killed after 13 days.

The experiment was complicated by the fact that some of the pigs showed, at autopsy, young adult *Ascaris* which could not have developed from the eggs

PLATE 1



Posterior surface of liver of pig killed three days after receiving approximately 400,000 embryonated *Ascaris* eggs.

PLATE II

Posterior surface of liver of pig killed six days after receiving approximately 400,000 embryonated *Ascaris* eggs.

administered during the experimental period. It was not surprising, therefore, that an occasional old " milk spot " was found in the liver of several pigs, but such lesions were easily differentiated from the much more numerous and more recent foci resulting from feeding large numbers of *Ascaris* eggs a few days previously.

In a second series of experiments on a litter of 11 pigs, the results of which are not yet complete, we attempted to secure a litter of weaned pigs free from natural *Ascaris* infestation by selecting them from a sow from which fæcal samples taken weekly over a period of three weeks were negative for *Ascaris* eggs. In spite of this precaution a proportion of the young pigs were found, at autopsy, to contain young adult *Ascaris* which must have developed from infective eggs ingested during the suckling period. As in the first litter, however, it was easy to distinguish the occasional natural " milk spot " from the more numerous and recent experimentally induced lesions.

A detailed account of the findings in both series of experiments will be given in a subsequent paper.

The two figures show the lesions produced by feeding *Ascaris* eggs three and six days respectively before killing.

REFERENCE

White, E. G. (1941) : *Vet. J.*, *97*, 155-172.

Abstracts of Current Literature

Infection of Adult Cattle with Mycobacterium tuberculosis avium. By R. E. GLOVER. *J. Hyg.* 1941. *XLI*, 290.

IN this article the author refers to the testing of 35 unselected cattle with synthetic medium tuberculin and synthetic medium johnin, and their post-mortem examination. Following the inoculation of guinea-pigs or by cultural methods in five cases (14.3 per cent.) avian strains of tubercle bacilli of full virulence were recovered : in two of the cases, cultures of both avian and bovine tubercle bacilli were isolated, the avian from the glands of the alimentary tract of the cattle and the bovine from thoracic glands. From a further five cases (again 14.3 per cent.) there were some evidence of infection with the avian type. In one case, the organism was identical culturally with the avian type but was almost completely avirulent for laboratory animals; in two cases smears from the mesenteric and the thoracic glands showed acid-fast bacilli; in a further two cases typical tuberculous glands were found in a completely calcified state and were devoid of acid-fast organisms. The author points out that he failed to obtain cultures of organisms from the glands of guinea-pigs into which specimens from the last four animals were injected and, therefore, as far as they are concerned " infection with the avian type is largely presumptive but the nature and extent of the lesions suggests that such may have been the case."

XUM

Concerning the tuberculin and johnin tests, clear-cut reactions to johnin were found in seven instances while in one animal, a doubtful result was obtained and negative results in the remaining two.

Bovine Listerellosis in Iowa with Studies on a Recovered Case. By H. E. BIESTER and L. H. SCHWARTE. *N. Amer. Vet.* 1941. *XXII*, 729.

LISTERELLOSIS in domestic animals has been referred to in the literature in several countries during recent times. The following is a summary of the above article :—

" Data collected on bovine listerellosis in Iowa during the past three and one-half years suggest that this disease is more prevalent than it was first thought to be. Usually only a few animals in a herd were affected, but in some outbreaks as many as ten or twelve individuals developed the infection. Since listerellosis in cattle may be confused with other conditions, laboratory assistance should be sought when cattle show disturbances of the central nervous system. Bovine listerellosis must be differentiated from other infections, certain nutritional disorders and intoxications. The laboratory examination should include some of the procedures previously described in order that listerellosis will not be overlooked or confused with other conditions affecting the central nervous system.

" Recoveries have been reported by practitioners in field outbreaks of bovine listerellosis. A steer showing severe symptoms was submitted to the Institute for observation. The animal was destroyed about two and one-half weeks after recovery, at which time bacteriologic examination was negative. However, Listerella organisms were demonstrated in two bovine brains from this herd, submitted two days after this case was sent to the laboratory for observation. The recovered case showed very severe and widespread microscopic changes. Gross changes were absent in this case."

Clinical Observations on Nupercainal* as a Local Anæsthetic. By A. H. BRYAN. *N. Amer. Vet.* 1941. *XXII.* 749.

NUPERCAINAL has been used as a local anæsthetic for years in human surgery. It is non-narcotic and its action is prolonged. It is said to have an antiseptic action and a healing effect. As an ointment it is applied to open wounds and mucous membranes, and, after being allowed to act for a few minutes, surgical operation may be carried out without pain or discomfort. The author cites twelve clinical cases in which nupercainal was used and makes the following conclusions : " In minor surgery of the dog and cat, when open wounds, burns, abraded surfaces or membranes are involved, nupercainal is an ideal, topical analgesic or local anæsthetic ointment. However, it has no apparent anæsthetic value when it is used on the unbroken skin."

Cultivation of the Hog Cholera Virus. By C. TENBROECK. *J. Exp. Med.* 1941. *74*, 427.

THE recent work of Tenbroeck confirms Hecke's reported cultivation of hog cholera virus *in vitro*.† In the presence of fresh, minced swine testicle, the virus

* Nupercainal is a 1 per cent. a- butyloxycinchonic acid dicthylethylenediamide in a petrolatum-lanolin base.

† From *N. Amer. Vet.* 1941. XXVI, 739.

was grown in flasks containing Tyrode's solution (14 transfers), on the chorio-allantoic membrane of embryonated eggs (13 transfers), and on the surface of swine serum agar (13 transfers). The virus was grown through 26 consecutive transfers (following 13 transfers on egg, the virus was carried through 13 transfers on serum agar). Other tissue might have been used as successfully as swine testicle, but the virus could not be adapted to grow in embryonated eggs unless minced tissue was added.

There was no evidence of virus attenuation during the transfers, it produced characteristic hog cholera, and its effects could be neutralised by injections of commercial anti-hog cholera serum. Tenbroeck states :—

" It seems probable that the cultured virus is more active than the commonly used virus and that its practical use in hog cholera vaccination and hyper-immunisation would result in considerable savings."

A Study of Goat Spleen Tissue Vaccine as an Immunising Agent against Rinderpest. By K. S. NAIR, R. KRISHNAMURTI and G. S. KALYANASHADARAM. *Ind. J. of Vet. Sci. and An. Hus.* 1941. *XI,* 244.

FROM the results of laboratory and field studies the authors conclude that rinderpest goat spleen tissue is potent for four days when stored at room temperature and that its use confers a satisfactory immunity. They found that the reaction set up in buffalo-calves is severe and that a mortality of 20 per cent. may be found. They formed the opinion that " the application of this method of vaccination without serum in combating outbreaks of rinderpest is not suitable when the susceptibility of cattle and buffaloes is high. The following is their summary :—

" Experiments were conducted at the Serum Institute, Madras, with saline emulsions of rinderpest goat spleen stored at room temperature for varying periods. It was found that emulsion of fresh goat spleen tissue as well as emulsions prepared from spleen tissue stored at room temperature for 1 to 4 days (strength of the emulsion being one per cent. in 0.5 per cent. saline) produced uniformly severe rinderpest reactions in buffalo-calves, in doses of 1 c.c. and 0.5 c.c. and conferred immunity. Emulsions prepared from spleen tissue stored at room temperature for 5 to 10 days did not produce any reaction and had no antigenic value. The dose of either 0.5 c.c. or 1 c.c. made no appreciable difference in the severity of reactions produced or in the degree of immunity set up. The adoption of this method in the field to combat outbreaks of rinderpest was not found to be quite safe in the Madras province as the reactions set up after vaccination were rather severe."

Some Factors affecting the Incidence of Calf Scours. By W. T. S. THORP, J. F. SHIGLEY and M. A. FARREL. *Vet. Med.* 1942. *XXXVII,* 34.

THIS report deals with observations made on a large dairy herd over a period of 2½ years. Calf scour was a serious problem. The authors found that " where scours is very prevalent in a herd there is a lowered morbidity and mortality where the amount of dam's milk is regulated after the calf is a day

old." Four to six pounds of dam's milk per day was the amount given. They also found that calves from the better or higher producing cows showed a greater tendency to develop scours. Calves dying from the disease were 2-4 days old and showed a thin, watery, sometimes bloody diarrhœa. In 12 of 15 cases studied, nervous symptoms were noted just before or just after diarrhœa set in. The difference between post-mortem findings of calves fed on milk regulated in amount and those allowed to suck at will was that in the latter one or more large masses of coagulated milk, 3-5 inches in diameter, were found in the rumen. A small section of the article deals with bacteriology, in which it is shown that of 125 cultures isolated from 15 animals (from spleen, liver, kidney, heart-blood, brain and mesenteric lymphatic gland) the large majority were of the coliform group. A few hæmolytic and non-hæmolytic streptococci were also recovered; in four nervous cases, non-hæmolytic streptococci were isolated from the brain. The authors used various medicinal treatments with varied success. Calf scour serum was also used—a more specific serum was prepared by immunising cows with three strains of the coliform organisms and gave better protection when used as a routine procedure at birth. The authors' summary is as follows:—

"Observations on the cases of calf scours among 362 calves over a 2½ years period is reported. Our experience indicates that where calf scours is a serious problem in a high-producing herd, the regulation of the intake of dam's milk tends to reduce the incidence and severity of the syndrome. A specific serum was necessary to check the severe outbreak encountered here. After the scours had been brought under control the routine use of commercial sera at birth gave satisfactory results. The medicinal treatment of calves two to three days old was not highly successful where a large number of calves were affected. Medicinal treatment of calves over a week old has proved more satisfactory."

A Note on the Chemotherapeutic Action of 4 : 4¹—Diamidino Stilbene in Babesia Infections of Domestic Animals. By R. DAUBNEY and J. R. HUDSON. *An. Trop. Med and Paras.* 1941. *35*, 187.

THE authors' summary is as follows: "From a record of these few cases it appears that 4 : 4¹—diamidino stilbene is a useful therapeutic agent in the treatment of clinical cases of tick-fever (*B. canis* infection) in dogs, the therapeutic or clinically curative dose is much less than the 2.5 mgm. per kilo. required to produce a *sterilisans magna* in Lourie & Yorke's cases, which greatly increases the safety factor. Even with this reduced therapeutic dose of 1.5 mgm. per kilo., there is usually a train of symptoms lasting for an hour or more which may be so marked as to make it undesirable for the animal to be left with its owner during the first two hours after injection. On the other hand, with the reduced dosage its curative effect is apparently more certain than that of other drugs, including acaprin, since the proportion of relapses, as indicated by these records, must be low. The drug is unsuitable for administration to horses, in spite of its efficacy in the cure of biliary fever. It has not yet been possible to test it on cattle suffering clinically from redwater fever, but cattle tolerate doses many times greater than those likely to be needed for the cure of redwater fever."

Treatment of Canine Babesiasis by 4 : 4¹—Diamidino Diphenoxy Propane. By J. CARMICHAEL and R. N. T.-W. FIENNES. *An. Trop. Med. and Paras.* 1941. *35*, 191.

THE authors' summary is as follows: "The objectionable feature of trypan blue and acaprin in the treatment of tick-fever in dogs are discussed. The results of treatment with 4 : 4¹—diamidino diphenoxy propane of 116 cases of *B. canis* infection in dogs are recorded and considered satisfactory. No cases of toxicity due to the action of the drug have been observed. The intra-muscular route is the selected method of administration, owing to œdematous swellings which may occur when the subcutaneous route is used. Only a small number of relapses have occurred, but in these the drug has been successfully used for a second course of treatment."

Butter Fat and Baby Pigs. By L. N. MORIN. *N. Amer. Vet.* 1942. *23*, 32.

BECAUSE of the death of the sow, or for other reasons, it may be necessary to feed young pigs on cow's milk. The author gives some useful hints on the subject. "Do not allow new-born pigs to experience that fatal period of starvation that invariably follows if they do not receive proper nourishment soon after they have been farrowed. We are firmly convinced that an insufficient intake of the vital elements so badly needed at this critical period is the forerunner of many of our baby-pig ailments." Concerning methods of feeding, he finds the following to be the most successful: (1) Remove all pigs from the sow whenever it is discovered that the sow is not giving sufficient milk to nourish the pigs properly. The next day may be too late. Any weak pigs should be sacrificed. (2) Feed cow's milk containing 8-10 per cent. butterfat. [Cow's milk usually contains 4-5 per cent. butterfat, therefore to adjust the milk to the desired butterfat content, double the amount of cream in the quantity to be fed.] (3) Feed the 8-10 per cent. butterfat milk at the rate of two ounces per pig every two hours for the first 48 hours, gradually increasing both the amount of the milk and the intervals between feeding. He does not think bottle-feeding is necessary: shallow pans answer the purpose. The pigs should be on ground during the day to supply sunshine and prevent anæmia. (4) When 10 days old the pigs should be allowed rolled oats, or, preferably, hulled oats, and the 8-10 per cent. butterfat milk may be replaced by ordinary cow's milk fed in wooden troughs. This feeding may be continued for three weeks, when the milk can be changed to skim-milk. Pigs should not be overfed at this stage as, if so, they will become "pot-bellied" and "runty." Good sanitation must, of course, be practised and warm quarters are essential.

Studies on the Relationship of Brucellosis to Periodic Ophthalmia. By E. L. STUBBS and W. G. LOVE. *J.A.V.M.A.* 1941. *XCIX*, 476.

THE authors studied forty cases of periodic ophthalmia. Agglutination tests for brucellosis were made and in six a slight agglutination in low dilutions was found. All others were negative. The titres in the six were from 1 in 25 to 1 in 50, with only one showing complete agglutination. According to the interpretation of such tests in cattle all these reactions would be considered as suspicious. From the results of their work (clinical findings, ophthalmoscopic

examinations and the agglutination tests) the authors conclude that there is no indication of any relationship between brucellosis and periodic ophthalmia.

Immunisation against Cæcal Coccidiosis in Chickens by the use of X-ray—Attenuated Oocysts. By S. H. WAXLER. *J.A.V.M.A.* 1941. *XCIX*, 481.

THE author used hæmoglobin determinations (before and seven days after the experimental infection) as a test for the severity of the disease. There is evidence that chicks infected with X-ray—attenuated oocysts of *Eimeria tenella* acquire a certain amount of resistance to a second heavy infection with the same parasite. When measured by the above method the resistance seems to be almost as great as that afforded the survivors infected originally with untreated cultures of the parasite. As the deaths in the group receiving untreated cultures of the original infection was 50 per cent., it would appear that not only does the X-ray—attenuated oocysts give rise to a resistance but also that they are safe to use on susceptible chickens. The author points out that it is necessary to vary the amount of radiation according to the age of the chickens to be treated, the younger chicks requiring oocysts which have been attenuated slightly longer than those given to older birds. The summary is as follows: "In cæcal coccidiosis there was a progressive decrease in the hæmoglobin content of the blood with an increase in the severity. As the amount of X-ray exposure was increased there was a progressive attenuation of coccidial oocysts. As the attenuation was increased the severity of the disease from the treated cultures was decreased as indicated by the hæmoglobin content. The attenuation of oocysts by exposure to X-rays did not change within a period of six weeks. Chicks infected with a standardised X-ray—attenuated dose resisted a subsequent heavy reinfection almost as well as the survivors of a severe infection produced by untreated cultures."

Treatment of Ovine Tæniasis with Lead Arsenate. By E. C. MCCULLOCH and J. E. MCCOY. *J.A.V.M.A.* 1941. *XCIX*, 496.

THE authors carried out an experiment on a flock of 300 lambs which were unthrifty and not increasing normally in weight. Diarrhœa was present and the lambs passed frequently segments and tapeworms, identified as *Moniezia sp.* Ten of the lambs were taken out of the flock and seven received 24 grams of phenothiazine without any beneficial result. The remaining three each received 0.5 gram of lead arsenate in capsules. The following day "enormous numbers of tapeworm segments were passed and the lambs showed no ill-effect from the treatment." Four days later the first serum lambs were similarly treated with similar results. Then the 293 lambs in the flock each received 0.5 gram of lead arsenate. "No fatalities followed the medication nor were any lambs observed to be off feed." Tapeworm segments were passed in large numbers for three days. The treated lambs gained weight and when examined after slaughter four to eight months later no tapeworm segments were found. A further group of 255 lambs were similarly treated with similar results. The drug used is described as "spray-grade lead-arsenate powder in gelatine capsules." The authors' summary is: "The administration of 0.5 gm. of lead arsenate to yearling lambs appears to be a reasonably safe and effective tæniafuge against *Moniezia sp.* Phenothiazine in doses of 24 gm. had no effect on the genus of tapeworm."

Comparison of the Egg Production and Rate of Gain of Birds Negative and Positive to the Pullorum Test. By L. G. NICHOLSON and E. C. MCCULLOCH. *Vet. Med.* 1942. *XXXVII*, 44.

THE authors point out that poultry keepers are often puzzled by the fact that on carrying out the agglutination test for the detection of "carriers" of B.W.D. in a flock, sometimes the best looking and heaviest birds are positive reactors while the poorer birds are negative. They proceeded to show how the egg production and weight gain varied in the two groups by selecting at random six non-reactors and six reactors from a flock. All the selected fowls received the same treatment and daily records were made for a period of three months. It was shown that "the production of the reactor bird was from 8.4 to 44.7 per cent. lower than that of negative birds." Further, "during the trial the reactor birds weighed from 60 to 180 gm. more than the negative birds. At the end of the trial the reactors had gained an average of about 60 gm., whereas during the same period the negative birds had lost an average of about 30 gm." The numbers are small but the authors say that they "are paralleled by our field observations and may be of value in showing the advisability of eliminating pullorum disease reactors from laying flocks."

The Rôle of one Species of Cockroach and several Species of Flies in the Dissemination of Brucella. By H. H. RUHLAND and I. FOREST HUDDLESON. *Am. J. Vet. Res.* 1941. *II*, 371.

THE authors have carried out experiments "with the hope of finding a lead that might help to explain why brucellosis makes its appearance in non-infected herds kept under ideal conditions." They used the common cockroach and several species of flies commonly found in and near dairy sheds. The insects were allowed to feed on cultures of *Br. abortus* and were killed at intervals when their intestinal contents were removed and cultured. It was found that *Br. abortus* does not remain alive in the intestinal tract of the cockroach for more than 24 hours. From this and other findings it cannot be concluded that the cockroach is an important conveyor of Brucella. From the experiments with flies the authors state: "Since conclusive data have been obtained which show that certain well-known species of flies can excrete Brucella with intestinal droplets for four days and possibly longer periods, it follows that they must be considered as one of the possible means of transmitting brucellosis from animal to animal and animal to man. Every effort should be made to prevent flies from feeding on infective materials.

Iodized Mineral Oil as a Treatment for Bovine Mastitis. By D. A. SANDERS. *Am. J. Vet. Res.* 1941. *II*, 407.

THIS article is an account of some preliminary experiments carried out at the Florida Agricultural Experiment Station. The solution of iodine in mineral oil was made by mixing resublimed iodine U.S.P. crystals in U.S.P. liquid petro-

latum (heavy medicinal mineral oil). The iodine was first triturated in a small quantity of ether, which enables the iodine to dissolve more readily in the oil. Affected quarters were treated by injecting 100 to 300 c.c. of the preparation immediately after milking out and the quarter was lightly massaged. When up to 100 c.c. was injected, the preparation was allowed to remain in the udder overnight and when over 100 c.c. was used the injected quarter was thoroughly stripped after 45 minutes. " In most instances the free iodine in the solution injected into the milk cistern was partially decolourised by the chemical union with the udder secretion while being distributed over the epithelial surface by massage. The degree of discolouration depended upon the stage of lactation, thoroughness of removing the udder secretion before injection, thoroughness of the massage, amount and concentration of free iodine injected and surface area of the tissues treated." The author states that the amount injected will vary with the location and the extent of the injection and " that the degree of decolouration of the free iodine following massage was since used as an index of the amount to be injected."

Twelve lactating cows harbouring hæmolytic streptococci with chronic mastitis in one or more quarter were treated; also four cows harbouring micrococci in seven quarters and one cow harbouring staphylococci. The treatment in all cases was successful. The following is an exact quotation from the article: " The injections initiated a temporary inflammatory reaction of the udder tissues with the occurrence of erythrocytes in the fore milk, and diminished milk flow in some instances. No permanent ill effects have been detected as a result of injecting this preparation into the chronically infected lactating quarters. The inflammatory reaction which occurred as a result of the treatment subsided, the appearance of the milk returned to normal and the milk flow was restored within ten days. Mastitis micro-organisms have not been detected in microscopic examinations of stained smears prepared from incubated samples of fore milk of a number of quarters receiving the treatment. These examinations were made at weekly intervals. The longest period of observation was 60 days. One case of acute streptococcic mastitis treated with iodized mineral oil appeared to be aggravated. Since little information is at hand on the treatment of acute mastitis with iodized mineral oil, it would not seem advisable to superimpose this therapeutic inflammation upon an extensive acute inflammation already existing."

Some Factors Affecting Fertility in Swine. By R. W. PHILLIPS and J. H. ZELLER. *Am. J. Vet. Res.* 1941. *II*, 439.

PART of the summary of this paper reads: " (1) There appears to be differences in the level of fertility in the breed groups observed, as measured by proportion of breeding seasons of which conception failed, number of services required per pregnancy and the size of litter. Differences were also found in the proportion of abnormal pigs and the proportion of pigs weaned. These apparent differences in breed groups would not be generally applicable to the breeds as a whole. (2) The relative importance of points at which the reproductive process fails, as indicated by the percentage of ova lost, are as follows: (a) failure of conception, 36.4 per cent.; (b) loss from conception to parturition,

19.9 per cent.; (c) loss from parturition to weaning, 14.6 per cent.; and (d) loss at parturition, 2 per cent. This leaves 27.1 per cent. of the ova which have the chance to be fertilised represented by live pigs at weaning. (3) The level of fertility in boars appears to be quite variable, as indicated by services required per pregnancy, size of litter sired, percentage of offspring weaned and proportion of abnormal pigs sired."

A Milk-spread Epidemic of Scarlet Fever. By R. DOUGLAS, J. SMITH, I. N. SUTHERLAND and R. J. P. WATSON. *Jl. Hyg.* 1941. *41*, 543.

IN this article there is described a milk-spread epidemic of scarlet fever in the burgh of Elgin. The following is an abstract from the summary: "An account is given of an epidemic of 214 cases of scarlet fever occurring in Elgin between 13.1.39 and 2.3.39. A random sample of the patients showed that the causative organism was a hæmolytic streptococcus giving the reactions of Lancefield's Group A and Griffith's Type 3. The probability that the infection was spread in the milk from one supply was high. Evidence is given which points to the occurrence of frank and sub-clinical cases of scarlet fever in members of a family which managed the dairy farm, and especially in one who was in contact with the cows of the supply. One apparently healthy cow in the herd was found to be excreting hæmolytic streptococci which gave the reactions of Lancefield's Group A and Griffith's Type 3 from one quarter of the udder. Three weeks after exclusion from the herd, clinical signs appeared of induration in this quarter only of the cow's udder."

Sterility Due to Ovarian Disease. By R. A. MCINTOSH. *Can. J. Comp. Med.* 1941. *5*, 341.

THIS is an interesting and instructive article. It opens with a review of the function of the ovary and a description of its hormone activity. The association of the ovary with sterility is summed up in a paragraph as follows: "In the diagnosis of sterility too often the ovaries are incriminated. It should be remembered that if the œstral cycle is rhythmic and œstrum occurs at the regular intervals peculiar to the species that the ovary is functioning normally. In other words, if œstrum is normal, some other condition in some other part of the genital tract is the cause for a failure to conceive. If the ovary is at fault invariably there is abnormality in the œstral cycle. This is manifested in a number of ways. The affected animal may not come in œstrum at all. This happens when the corpus luteum remains on the ovary after parturition and is most frequently observed in nutritional deficiencies such as aphosphorosis and a lack of vitamin A. General debility will also give rise to it. On occasions, it occurs in conjunction with severe genital and uterine infections." Descriptions of sterility associated with retained corpus luteum, cysts on the ovaries and functional disturbance. The article ends in the following paragraph: "The recognition of ovarian disease is based mainly on the character of the œstral cycle. The correction of such cases requires the careful manipulation of the ovaries and this can be accomplished only after much study and experience in the work."

Review

Veterinary Anæsthesia. By JOHN G. WRIGHT, F.R.C.V.S. Pp. viii, 207. 56 Illustrations, 7 Plates. London: Baillière, Tindall & Cox. Price 10s. 6d.

FOR the use of veterinary surgeons, practitioners and others, there is a dearth of up-to-date text-books. In this recent publication, "Veterinary Anæsthesia," by Professor J. G. Wright, one of the deficiencies has been made good. As the author says in his preface: "The success of a veterinarian as a surgeon depends in no small degree on his knowledge of anæsthetics and his skill in their administration." Within recent years there has been accumulated a mass of information on this subject and the author himself has been instrumental, in no small measure, in adding to our present-day knowledge. While some of the observations and results of trials, experiments and experiences have been published in individual articles in veterinary and other scientific journals, we have in this new volume, collected in concise and orderly form, the latest information on the subject. A very pleasing feature of this publication is that it contains the results of the author's own first-hand observations and experiences. Throughout the whole work one is impressed with the fact that it contains much of the author's own work. In addition to clear descriptions of the methods used to induce anæsthesia and full portrayals of the various features concerning them, e.g., anatomical descriptions of the parts involved, etc., many useful practical hints are incorporated. For example, sizes and types of syringes, needles, etc., with hints as to their preservation, practical methods of making injections under field conditions, etc., are included.

The book, which consists of a preface, 27 chapters and an appendix, is filled with much useful information of a thoroughly practical nature and we are satisfied that it will be found to fill an important place in the life of veterinary surgeons whose duties include the operative treatment of domestic animals. We have no hesitation in recommending this volume to the veterinary profession.

The illustrations are excellent and highly descriptive and the publishers are to be congratulated on the attractive publication.

Publishers' Notices

All communications should be addressed to 7 and 8, Henrietta Street, Covent Garden, London, W.C.2. Telephone: Temple Bar 8568. Telegrams: "Baillière Phone, London."

Letters for the Journal, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editor.

Copy of advertisements should be in the hands of the publishers—Baillière, Tindall and Cox—not later than the 1st of the month, if proof is required.

Binding Cases for Volume 97 and any other previous volumes can be obtained from the publishers. Price 2s. 9d. post free.

Annual Subscription, 25s. ($6.00 U.S.A. currency), post free.